

FIGURE 1

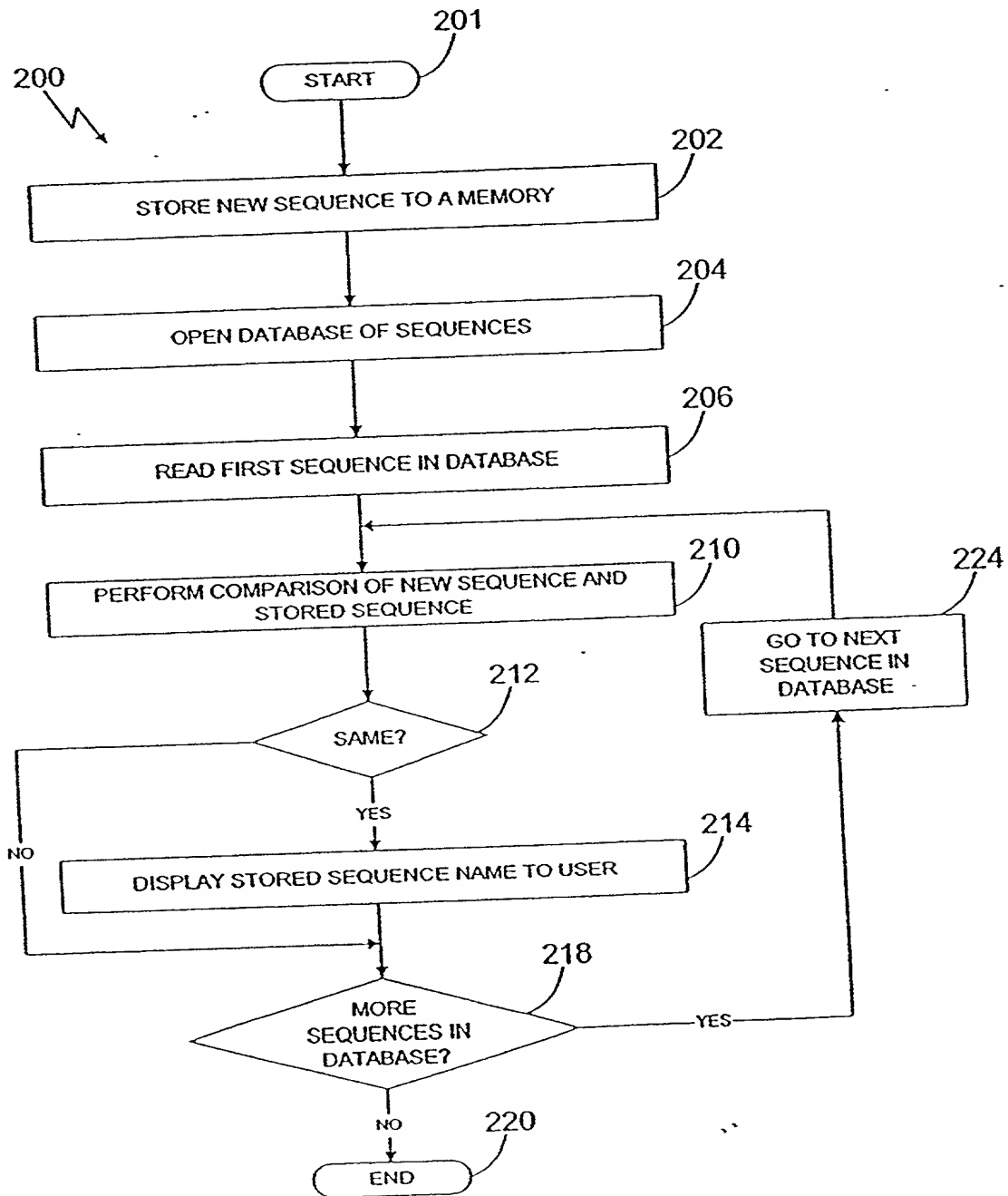


FIGURE 2

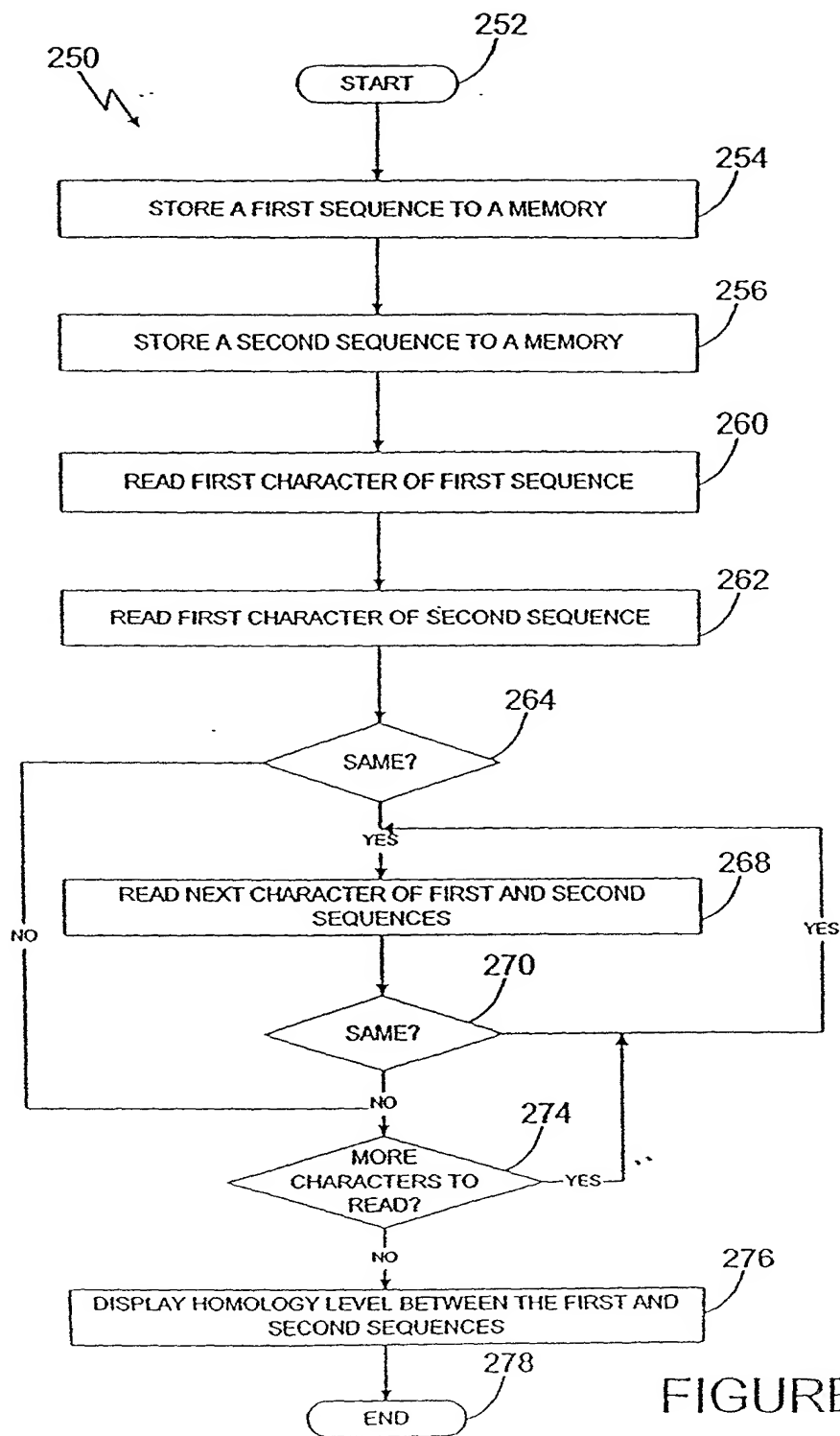


FIGURE 3

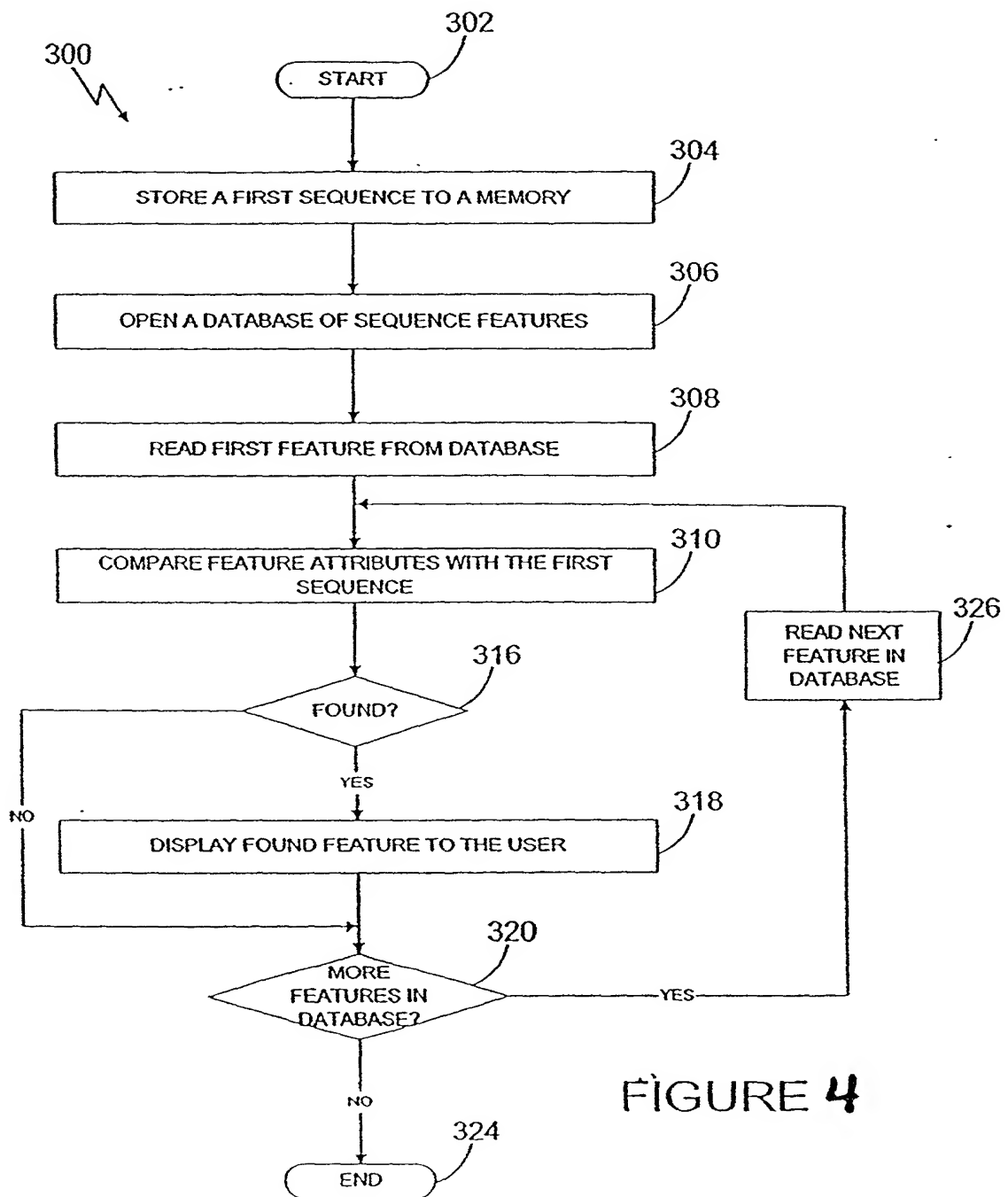


FIGURE 4

FIGURE 5A NUCLEOTIDE SEQUENCE FOR Y. PESTIS BLAST PHYTASE (SEQ ID NO:1)

ATGTCAGTATTAGAAAATCGTGTACGGCTATCTGGGCTGGTATTGATGCTAAGCGGA
TTGGCTGCTATTACTGCGCCGGTAGCCGCCGAGCCATCGGGCTATACTTTAGAACGT
GTGGTTATTTTGAGTCGCCATGGTGTTCGCTCGCCGACCAAACAAACGCAGCTTATG
AATGATGTTACGCCAGATAAGTGGCCACAATGGCCGGTAAAAGCGGGGTATTTAAC
GCCACGTGGTGC GGAGTTGGTCACATTGATGGGGGGGGT TTTATGGTGATTACTTTCG
CAGCCTTGGTTTGTAGCGGCGGGATGTCCGGCAGAGGGGGGGGTATATGCACAGG
CAGATATCGATCAACGTACCCGCTTAACCGGACAGGCATTTCTTGATGGTGTGGCTC
CGGGGTGTGGTTTGACCGTGCATAATCAGGCCGATTTGAAAAAGACCGATCCCTGT
TCCATCCGGTAGAGGNTGGCGTGTGTAAGTTANACGNNGCACAAACAGATAAAGCG
ATTGAAGAACANTTGGGCGGGCCGTTAGATACGGTGAGCCAGCGCTACGCTAAACC
TTTTGCCCAGATGGGGGACGTGCTGAATTTTGC GGCTTCTCCTTATTGCAAATCTTTG
CAACAGCAAGGAAAAACGTGTGATTTTGCCCACTTTGCGGCCAATGAAGTTAACGTT
AATAAAGAAGGGACAAAAGTGACCCTCAGTGGGCCACTGGCGTTATCATCGACATT
GGGTGAAATCTTCTTATTACAAAACGCACAAGCCATGCCAGAGGTTGCCTGGCAAC
GGCTAAAAGGGGCGGAGAATTGGGTATCCTTATTGTCATTACATAACGCGCAATTTA
ATTTAATGGCAAAAACACCGTATATCGCCCGTCATAAAGGGACGCCATTATTACAGC
AGATAGATACGGCTTTAACCCTTCAACTGGATGCTCAGGGGCAAAAGCTACCCATTT
CAGCCCAAAACCGGGTCTTGTTCCCTCGGTGGGCATGATACCAATATTGCCAATATTG
CGGGTATGCTGGGAGCCGACTGGCAGCTACCCGAGCAACCTGATAATACTCCACCA
GGTGGGGGATTGGTTTTTGA ACTATGGCAAAATCCGGATAACCACCAGCGCTACGTT
GCGGTGAAGATGTTCTACCAAACGATGGATCAGTTGCGTAATGCCGAAAAATTGGA
TCTGAAAAATAAACCAGCGGGTATTATTTCCGTTGCAGTTGCTGGTTGTGAAAATAA
CGGTGACGATAAGCTTTGCGAGCTTGATACATTCCAAAAGAAAGTGGCTAAGGTAA
TTGAACCTGCCTGCCACATCTAA

FIGURE 5B NUCLEOTIDE SEQUENCE FOR CORRECTED Y. PESTIS BLAST PHYTASE (SEQ ID NO:2)

MSVLENRVRLSGLVLMLSGLAAITAPVAAEPSGYTLERVVILSRHGVRSPTKQTQLMND
VTPDKWPQWPVKAGYLTPRGAEVTLMGGFYGDYFRSLGLLAAGCPAEGGVYAQADI
DQRTRLTGQAFLDGVAPGCGLTVHNQADLKKTDPLFHPVEXGVCKLXXAQTDKAIEEX
LGGPLDTSQRYAKPFAQMGDVLNFAASPYCKSLQQQGKTCDFAHFAANEVNVNKEG
TKVTLSGPLALSSTLGEIFLLQNAQAMPEVAWQRLKGAENWVSLLSLHNAQFNLMAKT
PYIARHKGTPLLQQIDTALTLQLDAQGQKLPISAQNRVLFLGGHDTNIANIAGMLGADW
QLPEQPDNTPPGGGLVFELWQNPDNHQRYVAVKMFYQTM DQLRNAEKLDLKNNPAGII
SVAVAGCENNGDDKLCELDTFQKKVAKVIEPACHI

**FIGURE 5C NUCLEOTIDE SEQUENCE FOR CORRECTED Y. PESTIS PHYTASE
(SEQ ID NO:3)**

ATGTCAGTATTAGAAAATCGTGTACGGCTATCTGGGCTGGTATTGATGCTAAGCGGA
TTGGCTGCTATTACTGCGCCGGTAGCCGCCGAGCCATCGGGCTATACTTTAGAACGT
GTGGTTATTTTGAGTCGCCATGGTGTTCGCTCGCCGACCAAACAAACGCAGCTTATG
AATGATGTTACGCCAGATAAGTGGCCACAATGGCCGGTAAAAGCGGGGTATTTAAC
GCCACGTGGTGC GGAGTTGGTCACATTGATGGGGGGGTTTTATGGTGATTACTTTTCG
CAGCCTTGGTTTTGTTAGCGGCGGGATGTCCGGCAGAGGGGGGGGTATATGCACAGG
CAGATATCGATCAACGTACCCGCTTAACCGGACAGGCATTTCTTGATGGTGTGGCTC
CGGGGTGTGGTTTGACCGTGCATAATCAGGCCGATTTGAAAAAGACCGATCCCCTGT
TCCATCCGGTAGAGACTGGCGTGTGTAAGTTAGACAACGCACAAACAGATAAAGCG
ATTGAAGAACGATTGGGCGGGCCGTTAGATACGGTGAGCCAGCGCTACGCTAAACC
TTTTGCCCAGATGGGGGACGTGCTGAATTTTGCGGCTTCTCCTTATTGCAAATCTTTG
CAACAGCAAGGAAAAACGTGTGATTTTGCCCACTTTGCGGCCAATGAAGTTAACGTT
AATAAAGAAGGGACAAAAGTGACCCTCAGTGGGCCACTGGCGTTATCATCGACATT
GGGTGAAATCTTCTTATTACAAAACGCACAAGCCATGCCAGAGGTTGCCTGGCAAC
GGCTAAAAGGGGCGGAGAATTGGGTATCCTTATTGTCATTACATAACGCGCAATTTA
ATTTAATGGCAAAAACACCGTATATCGCCCGTCATAAAGGGACGCCATTATTACAGC
AGATAGATACGGCTTTAACCCCTTCAACTGGATGCTCAGGGGCAAAAAGCTACCCATTT
CAGCCCAAAACCGGGTCTTGTTCCCTCGGTGGGCATGATACCAATATTGCCAATATTG
CGGGTATGCTGGGAGCCGACTGGCAGCTACCCGAGCAACCTGATAATACTCCACCA
GGTGGGGGATTGGTTTTTTGAACTATGGCAAAATCCGGATAACCACCAGCGCTACGTT
GCGGTGAAGATGTTCTACCAAACGATGGATCAGTTGCGTAATGCCGAAAAAATTGGA
TCTGAAAAATAAACCAGCGGGTATTATTTCCGTTGCAGTTGCTGGTTGTGAAAATAA
CGGTGACGATAAGCTTTGCGAGCTTGATACATTCCAAAAGAAAGTGGCTAAGGTAA
TTGAACCTGCCTGCCACATCTAA

**FIGURE 5D: AMINO ACID SEQUENCE FOR CORRECTED Y. PESTIS PHYTASE
(SEQ ID NO:4)**

Met Ser Val Leu Glu Asn Arg Val Arg Leu Ser Gly Leu Val Leu Met Leu Ser Gly Leu Ala Ala
Ile Thr Ala Pro Val Ala Ala Glu Pro Ser Gly Tyr Thr Leu Glu Arg Val Val Ile Leu Ser Arg His
Gly Val Arg Ser Pro Thr Lys Gln Thr Gln Leu Met Asn Asp Val Thr Pro Asp Lys Trp Pro Gln
Trp Pro Val Lys Ala Gly Tyr Leu Thr Pro Arg Gly Ala Glu Leu Val Thr Leu Met Gly Gly Phe
Tyr Gly Asp Tyr Phe Arg Ser Leu Gly Leu Leu Ala Ala Gly Cys Pro Ala Glu Gly Gly Val Tyr
Ala Gln Ala Asp Ile Asp Gln Arg Thr Arg Leu Thr Gly Gln Ala Phe Leu Asp Gly Val Ala Pro
Gly Cys Gly Leu Thr Val His Asn Gln Ala Asp Leu Lys Lys Thr Asp Pro Leu Phe His Pro Val
Glu Thr Gly Val Cys Lys Leu Asp Asn Ala Gln Thr Asp Lys Ala Ile Glu Glu Arg Leu Gly Gly
Pro Leu Asp Thr Val Ser Gln Arg Tyr Ala Lys Pro Phe Ala Gln Met Gly Asp Val Leu Asn Phe
Ala Ala Ser Pro Tyr Cys Lys Ser Leu Gln Gln Gln Gly Lys Thr Cys Asp Phe Ala His Phe Ala
Ala Asn Glu Val Asn Val Asn Lys Glu Gly Thr Lys Val Thr Leu Ser Gly Pro Leu Ala Leu Ser
Ser Thr Leu Gly Glu Ile Phe Leu Leu Gln Asn Ala Gln Ala Met Pro Glu Val Ala Trp Gln Arg
Leu Lys Gly Ala Glu Asn Trp Val Ser Leu Leu Ser Leu His Asn Ala Gln Phe Asn Leu Met Ala
Lys Thr Pro Tyr Ile Ala Arg His Lys Gly Thr Pro Leu Leu Gln Gln Ile Asp Thr Ala Leu Thr Leu
Gln Leu Asp Ala Gln Gly Gln Lys Leu Pro Ile Ser Ala Gln Asn Arg Val Leu Phe Leu Gly Gly
His Asp Thr Asn Ile Ala Asn Ile Ala Gly Met Leu Gly Ala Asp Trp Gln Leu Pro Glu Gln Pro
Asp Asn Thr Pro Pro Gly Gly Gly Leu Val Phe Glu Leu Trp Gln Asn Pro Asp Asn His Gln Arg
Tyr Val Ala Val Lys Met Phe Tyr Gln Thr Met Asp Gln Leu Arg Asn Ala Glu Lys Leu Asp Leu
Lys Asn Asn Pro Ala Gly Ile Ile Ser Val Ala Val Ala Gly Cys Glu Asn Asn Gly Asp Asp Lys

FIGURE 5E: NUCLEOTIDE SEQUENCE FOR 953-6 (SEQ ID NO: 5)

ATGATCGATAAATTTATTCCACAAGGGAGAGAGTCCGTGAAGCATAGCCTGCTTTTG
TCCGCCGCGCTGCTGGCGGGATGCGCCGCGTCCGCGCCCGGCGCCGACGCATCGCCT
GCCGCGCCGGGGTCGCTAAAGCTCGAAAAGGTTCGTGATGCTGATGCGCCACGGCGT
TCGCCCCGCCAACCAAGGCGGCGGTGGTGGCGCCCGGTTATTTCGGCCGAAACATGGC
CCGACTGGCCGGTCGATTTTCGGCCTGCTGACGCCGCACGGCGCGGCGGGGGTCAAG
CTGCTCGGCGAAAGCGACCGCCTCACTTTTCGGCGGTTCGCGGCCTATTCCCGGACGGT
TGTCCCGCCGCGGGCACGATCGTCCTCAAGGCAAGCTACAAGGAGCGCACGATCGC
GACCGCGCAGAACTGGGCGCGGGGTTTCATGCCCGGCTGCACGGCGGATGTCGCGC
ATCCCGCCGGTCCGGACGATGACGCGATCTTTTCATGGGCTCGACGGCGGCCCCGCCT
CGTTCGACGGCAAGCGGGCATTTCGATGCCGCGCTCGCCAGGCGCCCGAGGGCGGG
CTGACCGCCGAAACCGCACGCCATCGCGGCGAACTGACCTTGCTCGCGAAAGTGCT
GAATTGTGCGCTGCCCCGCTGCCCCGCTGATCGCCGAGCCGAGCCGACTGGTTCGCGCA
GCCGCACGATCGCCCCGATCTCGAAGGCCCGCTCGACGTCGGATCGACCGCGAGCC
AGACGCTGGTGCTGGAATATCTGGAAGGCAAGCCGATGGCCGAGGTTCGGCTGGGGC
CGCGTAAGCCGCGCCGAGATCGAGCAGTTGCTGCGCTTTCATCCGCTCAAATTCCGC
TATTCGAATCGCCCCGGCTATATCGCCGCCGCCGCCGCGGCGCCGATCGTGCGCGAA
ATCGTTGCGGCGCTCGACAGCAACAGCCCCGGCGCGGCTGACCTTGCTCGCCGGGCA
CGACACGAACGTCGCCGACCTCGGCGGCTTCTTCGACCTGCACTGGCAGGTGCCGA
GCTATCCCGCCGACGAGGTTCCGCCCGGCAGCGCGTTGGGGTTCGAGCTGGTCAGC
AACCGGAAGGGCGACCGCTATGTCCGCGCCTTCTATCGCGCGCAGACGATGGACCA
GCTCCGCAACCTCGAACCCTGGGGTCGGGTGACGCGCTGTACCGCCGCTATCTTCC
CATTCCGGGGTGCGGCCATTTCGGTCGAGGCAACCGCGTGCAGCTGGAGTGATTTTCG
CCGGCTCGCCGCGCCGCGCGGGTAA

FIGURE 5F: AMINO ACID SEQUENCE FOR 953-6 (SEQ ID NO:6)

Met Ile Asp Lys Phe Ile Pro Gln Gly Arg Glu Ser Val Lys His Ser Leu Leu Leu Ser Ala Ala Leu
Leu Ala Gly Cys Ala Ala Ser Ala Pro Gly Ala Asp Ala Ser Pro Ala Ala Pro Gly Ser Leu Lys
Leu Glu Lys Val Val Met Leu Met Arg His Gly Val Arg Pro Pro Thr Lys Ala Ala Val Val Pro
Pro Gly Tyr Ser Ala Glu Thr Trp Pro Asp Trp Pro Val Asp Phe Gly Leu Leu Thr Pro His Gly
Ala Ala Gly Val Lys Leu Leu Gly Glu Ser Asp Arg Leu Thr Phe Gly Gly Arg Gly Leu Phe Pro
Asp Gly Cys Pro Ala Ala Gly Thr Ile Val Leu Lys Ala Ser Tyr Lys Glu Arg Thr Ile Ala Thr Ala
Gln Asn Trp Ala Ala Gly Phe Met Pro Gly Cys Thr Ala Asp Val Ala His Pro Ala Gly Pro Asp
Asp Asp Ala Ile Phe His Gly Leu Asp Gly Gly Pro Ala Ser Phe Asp Gly Lys Arg Ala Phe Asp
Ala Ala Leu Ala Gln Ala Pro Glu Gly Gly Leu Thr Ala Glu Thr Ala Arg His Arg Gly Glu Leu
Thr Leu Leu Ala Lys Val Leu Asn Cys Ala Leu Pro Ala Cys Pro Leu Ile Ala Glu Pro Ser Arg
Leu Val Ala Gln Pro His Asp Arg Pro Asp Leu Glu Gly Pro Leu Asp Val Gly Ser Thr Ala Ser
Gln Thr Leu Val Leu Glu Tyr Leu Glu Gly Lys Pro Met Ala Glu Val Gly Trp Gly Arg Val Ser
Arg Ala Glu Ile Glu Gln Leu Leu Arg Phe His Pro Leu Lys Phe Arg Tyr Ser Asn Arg Pro Gly
Tyr Ile Ala Ala Ala Ala Ala Ala Pro Ile Val Arg Glu Ile Val Ala Ala Leu Asp Ser Asn Ser Pro
Ala Arg Leu Thr Leu Leu Ala Gly His Asp Thr Asn Val Ala Asp Leu Gly Gly Phe Phe Asp Leu
His Trp Gln Val Pro Ser Tyr Pro Ala Asp Glu Val Pro Pro Gly Ser Ala Leu Gly Phe Glu Leu Val
Ser Asn Ala Lys Gly Asp Arg Tyr Val Arg Ala Phe Tyr Arg Ala Gln Thr Met Asp Gln Leu Arg
Asn Leu Glu Pro Leu Gly Ser Gly Asp Ala Leu Tyr Arg Arg Tyr Leu Pro Ile Pro Gly Cys Gly
His Ser Val Glu Ala Thr Ala Cys Ser Trp Ser Asp Phe Ala Arg Leu Ala Ala Pro Arg Gly;

FIGURE 5G: NUCLEOTIDE SEQUENCE FOR RHIZOBIUM (SEQ ID NO: 7)

GTGAAGCATAGCCTGCTTTTGCCTGCCGCGCTGCTGGCGGGATGCGCCGCGTCCGCG
CCCGGAGCCGACGCATCGCCTGCCGCGCCGGGGTCGCTAAAGCTCGAAAAGGTCGT
AATGCTGATGCGCCACGGCGTTTCGCCCCCAACCAAGGCGGCGGTGGTGCCGCCCCG
GTTATTCGGCCGAAACATGGCCCGACTGGCCGGTCGATTCGGCCTGCTGACGCCGC
ACGGCGCGGCGGGGGTCAAGCTTCTCGGCGAAAGCGACCGCCTCTATTTCGGCGGT
CGCGGCCTGTTTCCCGAGGGATGCCCGGCGGCGGGCACGATCGTCCTCAAGGCGAG
CTACAAGGAGCGCACGATCGCCACCGCGCAGAGCTGGGCCGCGGGGTTCATGCCCG
GCTGCGCGACGGATGTCGCGCATCCCGCCGGTCCGGACGATGACGCGATCTTTCATG
GGCTCGACGGCGGGCCCCGCCTCGTTCGACGGCAAGCGGGCGTTTCGATGCCGCGCTC
GCCAGGCGCCCGAGGGCGGGCTGACCGCCGAAACCGCACGTCATCGCGGCGAACT
GACCTTGCTCGCGAAAGTGCTGAATTGCGCGCTGCCCGCCTGCCCGCTGATCGCCGA
GCCGAGCCGGCTGGTCGCGCAGCCGCACGATCGCCCCGAGATCGAAGGCCCGCTCG
ACGTCGGATCGACCGCCAGCCAGACGCTGGTGCTGGAATATCTGGAAGGCAAGCCG
ATGGCCGAGGTCGGCTGGGGCCGCGTGAGCCGCGCCGAGATCGAGCAGTTGCTGCG
CTTTCATCCGCTCAAATTCCGCTATTTCGAATCGCCCCGGCTATATCGCCGCCACCGCC
GCGGCGCCGATCGTGCGCGAAATCGTCACGGCGCTCGGCGACCGAAGCCCGGCGCG
GCTGACCTTGCTCGCCGGGCACGACACGAACGTCGCCGACCTCGGCGGCTTCTTCGA
CCTGCACTGGCAGGTGCCGAGTTATCCCGCCGACGAGGTTCCGCCCCGGCAGCGCACT
GGGGTTTGAAGTGGTCAGCAATGCGAAGGGCGACCGCTATGTCCGCGCCTTCTATCG
CGGGCAGACGATGGACCAGCTCCGCAACCTCGAACCCTGAGGTCGGACGATACGC
TGTTCCGCCGCTATCTTCCCATTCCGGGGTGCGGCAATTCGGTCGAGGCGACCGCT
GCGCCTGGAGTGATTTGCCCCGGCTCGCCGCGCCGCGCGGGTAA

FIGURE 5H: AMINO ACID SEQUENCE FOR RHIZOBIUM (SEQ ID NO:8)

Val Lys His Ser Leu Leu Leu Pro Ala Ala Leu Leu Ala Gly Cys Ala Ala Ser Ala Pro Gly Ala
 Asp Ala Ser Pro Ala Ala Pro Gly Ser Leu Lys Leu Glu Lys Val Val Met Leu Met Arg His Gly
 Val Arg Pro Pro Thr Lys Ala Ala Val Val Pro Pro Gly Tyr Ser Ala Glu Thr Trp Pro Asp Trp Pro
 Val Asp Phe Gly Leu Leu Thr Pro His Gly Ala Ala Gly Val Lys Leu Leu Gly Glu Ser Asp Arg
 Leu Tyr Phe Gly Gly Arg Gly Leu Phe Pro Glu Gly Cys Pro Ala Ala Gly Thr Ile Val Leu Lys
 Ala Ser Tyr Lys Glu Arg Thr Ile Ala Thr Ala Gln Ser Trp Ala Ala Gly Phe Met Pro Gly Cys Ala
 Thr Asp Val Ala His Pro Ala Gly Pro Asp Asp Asp Ala Ile Phe His Gly Leu Asp Gly Gly Pro
 Ala Ser Phe Asp Gly Lys Arg Ala Phe Asp Ala Ala Leu Ala Gln Ala Pro Glu Gly Gly Leu Thr
 Ala Glu Thr Ala Arg His Arg Gly Glu Leu Thr Leu Leu Ala Lys Val Leu Asn Cys Ala Leu Pro
 Ala Cys Pro Leu Ile Ala Glu Pro Ser Arg Leu Val Ala Gln Pro His Asp Arg Pro Glu Ile Glu Gly
 Pro Leu Asp Val Gly Ser Thr Ala Ser Gln Thr Leu Val Leu Glu Tyr Leu Glu Gly Lys Pro Met
 Ala Glu Val Gly Trp Gly Arg Val Ser Arg Ala Glu Ile Glu Gln Leu Leu Arg Phe His Pro Leu
 Lys Phe Arg Tyr Ser Asn Arg Pro Gly Tyr Ile Ala Ala Thr Ala Ala Ala Pro Ile Val Arg Glu Ile
 Val Thr Ala Leu Gly Asp Arg Ser Pro Ala Arg Leu Thr Leu Leu Ala Gly His Asp Thr Asn Val
 Ala Asp Leu Gly Gly Phe Phe Asp Leu His Trp Gln Val Pro Ser Tyr Pro Ala Asp Glu Val Pro
 Pro Gly Ser Ala Leu Gly Phe Glu Leu Val Ser Asn Ala Lys Gly Asp Arg Tyr Val Arg Ala Phe
 Tyr Arg Gly Gln Thr Met Asp Gln Leu Arg Asn Leu Glu Pro Leu Arg Ser Asp Asp Thr Leu Phe
 Arg Arg Tyr Leu Pro Ile Pro Gly Cys Gly Asn Ser Val Glu Ala Thr Ala Cys Ala Trp Ser Asp
 Phe Ala Arg Leu Ala Ala Pro Arg Gly;

FIGURE 51: NUCLEOTIDE SEQUENCE FOR 954-2 (SEQ ID NO:9)

ATGAAGAAGACGATATGGAGGAGAGTTGGACAGCGATGGCGAAGGGGTGCGTGTG
CCGCAACGGTATTGCTTTCGGCATGCTCAACGCAACTGCCGGGCGTGCTGCAACGC
TGTCGGCCGCGGGTAGCGAGCCGCCCCGGAAGGCCGCGGCAACAGATGGCATGCCG
CAAGACTGGTCGCTCGACGCGTTGGTCATCGTCAGCCGGCACGGCGTGCGGTCTCCG
ACGCGTCCGGAGCCGCGCTGGAGAGCCTCAGCCCCGATCCGTGGCCCCAGTGGCC
CGTGCCGACTGCCACCTGACCGATCGTGGCGCGGCGCTCGTCTCGCAGATGGGGC
GGTACTACGGTGATTGGCTTCGTGCCCGGGGTGTGCTGCCGGCCAGCGGGTGCCCTG
CGACCGGAACGCTTTACGGATGGGCAGACGTTGACCAGCGGACCCGTCTGACGGGC
GACGCCCTGCTCCTCGGCATGGCGCCAGGCTGCGGTATCCACAGCGATCATCGCGCG
GCGCTCGACGAGAAGGATCCGATCTTCCACGCGATGGAATCGGGTGCATGCCCAGT
CGACCCCGTACAGGCGAAGCGCGACATCGAAGCGCATGCCGGCGAGGGCGGCGTG
GCGACACTGGGAAGGCGCTACGCAGCAAGCCTGACCAGAATGAGCGAGGTGCTCGA
CTACGCCCATAGCGCCGATTGCGCGAGGCATGGCGGCCAATGCGACTATGCGCGCC
AACCCAATCGTGTGCGAGATCAGACCAGATGGCCTTCATGCCGCGTTGAAGGGCCCC
ATGGGCAGTGCTTCGACCGTCTCCGAGGTCTTCCTGCTCGAACATGGGCAGGGCCTG
CCACAGGAGCAGGTTGCATGGGGCCGTATCCACGATGCGCAGGACTGGACGCTGCT
GATGCAGGCGCATAACGCGCAGTTCGATCTGATGGCGAAGACGCCTTACATGGCTA
CTCGAAGGGGCACGCCGATGCTCGCTTCGGTGCTCGATGCGCTTGAGCGGGCGCGCTG
GCGCCCCAGCTCCGGAGCTTGCCGTCAAAGGCCCGAAGCTGCCCCAAGGCAACCGT
GTCTATGTGCTGACCGCGCATGACACGAATCTTGACACTTGGCCGGCTTGCTGCAC
TTGGACTGGACCCTGCCGAGCAACCGGACGACACGCCGCCGGGCGGTGCAATGGT
GTTCTCCTTGTGGCGGGAGCCTGGCACGCGAGGCACGTTTCGTTTCGCGTGGAGATGGT
CTATCAGTCGATGGATCAGCTTCGGCAGCTCACGCCGCTCTCCCTGGCGCAGCCGCC
CCATCGCCTGATCTTGCCGTTGCCCGGCTGTGCCGACGCGGCGCACGGACATGCATG
CAGCCTGCCGGAGTTCAGCCGGCGTGTGCGCGCGGCATTGTCCCCCTCCTGCCTGGA
GGCTGTGACCGCGGCGCACTAG

FIGURE 5J: AMINO ACID SEQUENCE FOR 954-2 (SEQ ID NO:10)

Met Lys Lys Thr Ile Trp Arg Arg Val Gly Gln Arg Trp Arg Arg Gly Ala Cys Ala Ala Thr Val
Leu Leu Ser Ala Cys Ser Thr Gln Leu Pro Gly Val Pro Ala Thr Leu Ser Ala Ala Gly Ser Glu Pro
Pro Arg Lys Ala Ala Ala Thr Asp Gly Met Pro Gln Asp Trp Ser Leu Asp Ala Leu Val Ile Val
Ser Arg His Gly Val Arg Ser Pro Thr Arg Pro Glu Pro Pro Leu Glu Ser Leu Ser Pro Asp Pro Trp
Pro Gln Trp Pro Val Pro Thr Ala His Leu Thr Asp Arg Gly Ala Ala Leu Val Ser Gln Met Gly
Arg Tyr Tyr Gly Asp Trp Leu Arg Ala Arg Gly Val Leu Pro Ala Ser Gly Cys Pro Ala Thr Gly
Thr Leu Tyr Gly Trp Ala Asp Val Asp Gln Arg Thr Arg Leu Thr Gly Asp Ala Leu Leu Leu Gly
Met Ala Pro Gly Cys Gly Ile His Ser Asp His Arg Ala Ala Leu Asp Glu Lys Asp Pro Ile Phe His
Ala Met Glu Ser Gly Ala Cys Pro Val Asp Pro Val Gln Ala Lys Arg Asp Ile Glu Ala His Ala
Gly Glu Gly Gly Val Ala Thr Leu Gly Arg Arg Tyr Ala Ala Ser Leu Thr Arg Met Ser Glu Val
Leu Asp Tyr Ala His Ser Ala Asp Cys Ala Arg His Gly Gly Gln Cys Asp Tyr Ala Arg Gln Pro
Asn Arg Val Glu Ile Arg Pro Asp Gly Leu His Ala Ala Leu Lys Gly Pro Met Gly Ser Ala Ser
Thr Val Ser Glu Val Phe Leu Leu Glu His Gly Gln Gly Leu Pro Gln Glu Gln Val Ala Trp Gly
Arg Ile His Asp Ala Gln Asp Trp Thr Leu Leu Met Gln Ala His Asn Ala Gln Phe Asp Leu Met
Ala Lys Thr Pro Tyr Met Ala Thr Arg Arg Gly Thr Pro Met Leu Ala Ser Val Leu Asp Ala Leu
Glu Arg Arg Ala Gly Ala Pro Ala Pro Glu Leu Ala Val Lys Gly Pro Lys Leu Pro Gln Gly Asn
Arg Val Tyr Val Leu Thr Ala His Asp Thr Asn Leu Ala His Leu Ala Gly Leu Leu His Leu Asp
Trp Thr Leu Pro Glu Gln Pro Asp Asp Thr Pro Pro Gly Gly Ala Met Val Phe Ser Leu Trp Arg
Glu Pro Gly Thr Gln Ala Arg Phe Val Arg Val Glu Met Val Tyr Gln Ser Met Asp Gln Leu Arg
Gln Leu Thr Pro Leu Ser Leu Ala Gln Pro Pro His Arg Leu Ile Leu Pro Leu Pro Gly Cys Ala
Asp Ala Ala His Gly His Ala Cys Ser Leu Pro Glu Phe Ser Arg Arg Val Arg Ala Ala Leu Ser
Pro Ser Cys Leu Glu Ala Val Thr Ala Ala His

FIGURE 5K: NUCLOETIDE SEQUENCE FOR THE EXPRESSED Y. PESTIS PHYTASE

ATGTCCGGACTGGAGAACCGCGTCCGCCTTTCCGGTTTAGTGTTAATGCTGTCCGGC
CTGGCTGCTATCACCGCGCCTGTGGCCGCCGAACCATCGGGGTACACCTTAGAACGT
GTAGTTATTTTGAGTCGCCATGGTGTGCGTAGCCCGACTAAGCAGACGCAGCTGATG
AATGATGTAAACACCTGATAAGTGGCCTCAGTGGCCGGTTAAAGCGGGCTATTTGACT
CCTCGTGGCGCCGAACCTGGTCACCCTGATGGGCGGGTTCTATGGCGATTATTTCCGC
AGTTTGGGTCTTTTGGCCGCGGGCTGCCCGGCAGAGGGCGGTGTATATGCACAGGCA
GATATCGACCAGCGCACTCGTTTAACCGGTCAGGCTTTTCTGGATGGTGTGGCGCCG
GGTTGCGGCCTGACTGTCCACAATCAGGCCGATCTTAAGAAAACCGATCCTCTGTTT
CATCCCGTTGAAACCGGCGTCTGTAAACTGGACAACGCCCAAACCGATAAGGCAAT
TGAGGAACGCCTGGGCGGCCCGTTAGACACGGTAAGCCAGCGCTATGCCAAACCGT
TTGCGCAAATGGGCGATGTCCTGAACTTCGCTGCGAGTCCGTACTGCAAGTCACTGC
AGCAGCAGGGGAAAACCTTGTGACTTCGCACACTTTGCGGCCAACGAAGTTAATGTA
AACAAAGGAAGGCACGAAAGTTACCCTGTCAGGCCCCCTGGCGCTGTCTAGCACGTT
GGGCGAAATCTTCTTGCTGCAGAACGCGCAGGCGATGCCCGAAGTAGCGTGGCAGC
GTTTGAAAGGCGCTGAGAACTGGGTGTCTCTTCTGAGCCTGCACAATGCACAGTTCA
ACCTGATGGCTAAAACGCCATACATTGCACGCCACAAAGGCACGCCGCTTTTACAG
CAAATCGATACCGCACTGACCCTGCAACTGGACGCCAGGGGCAAAAACCTGCCGAT
CTCGGCTCAGAACCGTGTTTTATTCTGGGTGGCCACGACACAAATATTGCTAACAT
CGCCGGTATGCTGGGCGCAGATTGGCAGTTACCGGAACAACCGGATAACACCCAC
CGGGCGGCGGTCTGGTCTTTGAGCTGTGGCAGAATCCGGACAATCATCAACGTTATG
TGGCCGTTAAGATGTTCTATCAGACCATGGATCAATTGCGTAACGCCGAGAAGCTGG
ATTTAAAGAACAATCCCGCCGGCATCATCAGTGTGCTGTGGCCGGCTGCGAGAATA
ATGGTGACGATAAACTGTGCGAACTTGATACTTTTCAAAAAAAGTAGCGAAAGTC
ATTGAACCTGCGTGTCATATTTAA

FIGURE 5L: AMINO ACID SEQUENCE FOR THE EXPRESSED Y. PESTIS PHYTASE
MSGLENRVRLSGLVLMLSGLAAPVAAEPSGYTLERVVILSRHGVRSPTKQTQLMND
VTPDKWPQWPVKAGYLTPRGAEVTLTMGGFYGDYFRSLGLLAAGCPAEGGVYAQADI
DQTRLTGQAFLDGVAPGCGLTVHNQADLKKTDPLFHPVETGVCKLDNAQTDKAIEER
LGGPLDVSQRYAKPFAQMGDVLNFAASPYCKSLQQQGKTCDFAHFAANEVNVNKEG
TKVTLSGPLALSSTLGEIFLLQNAQAMPEVAWQRLKGAENWVSLLSLHNAQFNLMAKT
PYIARHKGTPLLQQIDTALTQLDAQGQKLPISAQNRVFLGGHDTNANIAGMLGADW
QLPEQPDNTPPGGGLVFELWQNPDNHQRYVAVKMFYQTMDQLRNAEKLDLKNNPAGII
SVAVAGCENNGDDKLCELDTFQKKVAKVIEPACHI

FIGURE 5A NUCLEOTIDE SEQUENCE FOR Y. PESTIS BLAST PHYTASE (SEQ ID NO:1)

FIGURE 5b NUCLEOTIDE SEQUENCE FOR CORRECTED Y. PESTIS BLAST PHYTASE (SEQ ID NO:2)

FIGURE 5C NUCLEOTIDE SEQUENCE FOR CORRECTED Y. PESTIS PHYTASE (SEQ ID NO:3)

FIGURE 5C NUCLEOLIDE SEQUENCE FOR CONNECTED PLEIADAE

atgtcagattagaataatcgtgtacggcgtatcgtggcgctgtattgtatgataagcagccatcggcgctatactttagaacgtgtgtgtatttttgatcgc
ccattgtgttcgtcgcgcgcacaaacaaacagcattatgaatgtgttacgccagataagtgtgcccacaaatgtgcctgtataaagcgggggtatttaacgccacgtgtgtgtgaggtgtgtcacattgtatg
gggggggtttttatggtgtattcttcgcagcccttggtttgtgttagcggcgcgatgtccggcgaggggggggtatatgcacagcgagatcgtatacgtaccccgcttaacccggacagcgcatttcttgat
gggtgtgtcctccgggggtgtgtgttgaccgtgcataatcagcgcgatttgaaaaagacgcgtatccctgttccatccggctgacatgtgctgtaagttagacaacgcacaacacagataaagcgcgattg
aagaaacgattgtggcgggcggttagatacgtgtgagcgccagcgtacgtctaaacctttgtccacagatggggggacgtgtcgtgaattttgtggcttcccttattgtcaaatctttgcaaacagcaagsggaaaaacg
tgtgtattttgccactttgcgcgaatgtgaattaacgttaataaagaagggacaataagtgacctcagtgggccactggcgtttatcgcacattgggtgaaatcttctttattacaaaacgcacaaagccca
tgccagaggtgtccctgtgcaacggctaaaaggggcgcgagaaattgtgtatcctattgtcatcatataacgcgcgaatttaattatggcaaaaacacccgtatatacgcctgtataaaggcgacgccattatt
acagcagatagatcaggcctttaaccttcaactgtgatacagggcgcaaaagctaccacatttcagcccaaaaacggggtcttgttctcgtgtgggcatgtataccaattttgccaatattgtcgggtatgct
gggagccgcactgtggcagctaccggcaacctgtataatactccacaggtgtgggggattgtttttgaactatggcaaaatccggataaacccacgcgtctacgtgtggggtgaagatgtttctaccaaac
gatgtgtacagtgtcgtatgtccgaaaaattggatctgaaaaataaacccagcgggtattatttccgttcaggtgtgtgtgtgaaaaataacggtgtacataagctttgtcgagctgtatcacattccaaaag
aaagtgtgctaaagtaattgaacctgcctgccacatctaa;

FIGURE 5. AMINO ACID SEQUENCE FOR CORRECTED Y. PESTIS PHYTASE (SEQ ID NO:4)

FIGURE 5D: AMINO ACID SEQUENCE FOR CORRECTED Y. PESIIIS FULLY ASSE (SEQUENCE ID: YPESIIIS_0001). The sequence is: Met Ser Val Leu Glu Asn Arg Val Arg Leu Ser Gly Leu Val Leu Met Leu Ser Gly Leu Ala Ile Thr Ala Pro Val Ala Ala Glu Pro Ser Gly Tyr Thr Leu Glu Arg Val Val Ile Leu Ser Arg His Gly Val Arg Ser Pro Thr Lys Gln Thr Gln Leu Met Asn Asp Val Thr Pro Asp Lys Trp Pro Gln Trp Pro Val Lys Ala Gly Tyr Leu Thr Pro Arg Gly Ala Glu Leu Val Thr Leu Met Gly Phe Tyr Gly Asp Tyr Phe Arg Ser Leu Gly Leu Leu Ala Ala Gly Cys Pro Ala Glu Gly Gly Val Tyr Ala Gln Ala Asp Ile Asp Gln Arg Thr Arg Leu Thr Gly Gln Ala Phe Leu Asp Gly Val Ala Pro Gly Cys Gly Leu Thr Val His Asn Gln Ala Asp Leu Lys Lys Thr Asp Pro Leu Phe His Pro Val Glu Thr Gly Val Cys Lys Leu Asp Asn Ala Gln Thr Asp Lys Ala Ile Glu Arg Leu Gly Gly Pro Leu Asp Thr Val Ser Gln Arg Tyr Ala Lys Pro Phe Ala Gln Met Gly Asp Val Leu Asn Phe Ala Ala Ser Pro Tyr Cys Lys Ser Leu Gln Gln Gly Lys Thr Cys Asp Phe Ala His Phe Ala Ala Asn Glu Val Asn Val Asn Lys Glu Gly Thr Lys Val Thr Leu Ser Gly Pro Leu Ala Leu Ser Thr Leu Gly Glu Ile Phe Leu Leu Gln Asn Ala Gln Ala Met Pro Glu Val Ala Trp Gln Arg Leu Lys Gly Ala Glu Asn Trp Val Ser Leu Ser Leu His Asn Ala Gln Phe Asn Leu Met Ala Lys Thr Pro Tyr Ile Ala Arg His Lys Gly Thr Pro Leu Leu Gln Gln Ile Asp Thr Ala Leu Thr Leu Gln Leu Asp Ala Gln Gly Gln Lys Leu Pro Ile Ser Ala Gln Asn Arg Val Leu Phe Leu Gly Gly His Asp Thr Asn Ile Ala Asn Ile Ala Gly Met Leu Gly Ala Asp Trp Gln Leu Pro Glu Gln Pro Asp Asn Thr Pro Pro Gly Gly Gly Leu Val Phe Glu Leu Trp Gln Asn Pro

FIGURE 5G: NUCCLEOHIDE SEQUENCE FOR KILZODIUM (SEQ ID NO. 17)

FIGURE 5H: AMINO ACID SEQUENCE FOR RHIZOBIUM (SEQ ID NO:8)

Val Lys His Ser Leu Leu Pro Ala Ala Leu Leu Ala Gly Cys Ala Ser Ala Pro Gly Ala Asp Ala Ser Pro Ala Ala Pro Gly Ser
Leu Lys Leu Glu Lys Val Val Met Leu Met Arg His Gly Val Arg Pro Pro Thr Lys Ala Ala Val Val Pro Pro Gly Tyr Ser Ala Glu Thr
Trp Pro Asp Trp Pro Val Asp Phe Gly Leu Leu Thr Pro His Gly Ala Ala Gly Val Lys Leu Leu Gly Ser Asp Arg Leu Tyr Phe Gly
Gly Arg Gly Leu Phe Pro Glu Gly Cys Pro Ala Ala Gly Thr Ile Val Leu Lys Ala Ser Tyr Lys Glu Arg Thr Ile Ala Thr Ala Gln Ser Trp
Ala Ala Gly Phe Met Pro Gly Cys Ala Thr Asp Val Ala His Pro Ala Gly Pro Asp Asp Ala Ile Phe His Gly Leu Asp Gly Gly Pro
Ala Ser Phe Asp Gly Lys Arg Ala Phe Asp Ala Ala Leu Ala Gln Ala Pro Glu Gly Gly Leu Thr Ala Arg His Arg Gly Glu
Leu Thr Leu Leu Ala Lys Val Leu Asn Cys Ala Leu Pro Ala Cys Pro Leu Ile Ala Glu Pro Ser Arg Leu Val Ala Gln Pro His Asp Arg
Pro Glu Ile Glu Gly Pro Leu Asp Val Gly Ser Thr Ala Ser Gln Thr Leu Val Leu Glu Tyr Leu Glu Lys Pro Met Ala Glu Val Gly
Trp Gly Arg Val Ser Arg Ala Glu Ile Glu Gln Leu Leu Arg Phe His Pro Leu Lys Phe Arg Tyr Ser Asn Arg Pro Gly Tyr Ile Ala Ala
Thr Ala Ala Ala Pro Ile Val Arg Glu Ile Val Thr Ala Leu Gly Asp Arg Ser Pro Ala Arg Leu Thr Leu Leu Ala Gly His Asp Thr Asn
Val Ala Asp Leu Gly Gly Phe Phe Asp Leu His Trp Gln Val Pro Ser Tyr Pro Ala Asp Glu Val Pro Pro Gly Ser Ala Leu Gly Phe Glu
Leu Val Ser Asn Ala Lys Gly Asp Arg Tyr Val Arg Ala Phe Tyr Arg Gly Gln Thr Met Asp Gln Leu Arg Asn Leu Glu Pro Leu Arg
Ser Asp Asp Thr Leu Phe Arg Arg Tyr Leu Pro Ile Pro Gly Cys Gly Asn Ser Val Glu Ala Thr Ala Cys Ala Trp Ser Asp Phe Ala Arg
Leu Ala Ala Pro Arg Gly;

FIGURE 5I: NUCLEOTIDE SEQUENCE FOR 954-2 (SEQ ID NO:9)

atgaagaagacgatatggaggagagttggacacgcatggcgaaaggggtgctgtgtagccgaacgggtattgtttcggcactgctcaacgcaactgccggggcgtgacctgaacgctgtcggccgcg
 ggtagcgagccggccgggaagggccggcgaacagatggctgctcgacgcgttggtcattcgtcagccggcagcggcgtgctgctccgagcgtcggagcggccgc
 tggagagccctcagcccgatccgtggcccccagtgggcccgactgcccactgaccatgctggcggcgtcgtctcgagatggggcggctactacgggtgattggcttcgtgccccgggg
 tggctgcggccagcgggtgcccctgcgaccgggaacgcttttacggatggggcagacgttgaccagcggacccgctgacggggcagccctgctcctcggcatggcggccagcctgccccggtatcca
 cagcgatcgcggcgctcgacgagaaaggatccgatctccacgcgatggaaatgggtgcatgccagtcgaccccgctacagggcgaagcggcgcacatcgaaagcgcgcggcggagggc
 ggcggtggcgacactggggaaagcgctacgcagcaagcctgaccagaatgagcgaggtgctcgactacgcccactagcggcgttgcggagggcattggcgagggcctgcccacagggcagggtt
 ccaatcgtcgtgagatcagaccagatggccttcatggccgttgaagggcccgatgggcagtgctcgacgttccgaggttctcgtcgaacatggggcagggcctgcccacagggcagggtt
 gcatggggccgtatccacatgcgcaggactggacgctgctgatgcaggcgcataacgcgcagttcgtatggcgaaagacgccttacatggctactcgaaggggcacggccgatgctcgttc
 gggtcgtgatgcgcttgagcggcgcgctggcgccccagctccggagcttgcgtcaagggccgaagcgtgccccaaggcaacggtctatgctgacggcgcgcgcgcgaatcttgacacact
 tggcggccttgcacttggaactggaccctgcccagagcaaccgggaagacacgcgcggggcggtgcaatgggttctcgttggcggggcggcgtggcacgcaggtttcgttcgcgtggga
 gatggtctatcagtcgatggatcagcttcggcagctcacgcgcctctcctctggcgacggcccgccatgcctgatcttgcgggttgcggcgacggcgacggcgacatgcatgcagcct
 gccggagttcagccggcggtgtgcggcgggcattgtcccccctcctcctgctggaggctgtgaccggcgccactag;

FIGURE 5J: AMINO ACID SEQUENCE FOR 954-2 (SEQ ID NO:10)

Met Lys Lys Thr Ile Trp Arg Arg Val Gly Gln Arg Trp Arg Arg Gly Ala Cys Ala Ala Thr Val Leu Leu Ser Ala Cys Ser Thr Gln Leu
 Pro Gly Val Pro Ala Thr Leu Ser Ala Ala Gly Ser Glu Pro Arg Lys Ala Ala Ala Thr Asp Gly Met Pro Gln Asp Trp Ser Leu Asp
 Ala Leu Val Ile Val Ser Arg His Gly Val Arg Ser Pro Thr Arg Pro Glu Pro Leu Glu Ser Leu Ser Pro Asp Pro Trp Pro Gln Trp Pro
 Val Pro Thr Ala His Leu Thr Asp Arg Gly Ala Ala Leu Val Ser Gln Met Gly Arg Tyr Tyr Gly Asp Trp Leu Arg Ala Arg Gly Val Leu
 Pro Ala Ser Gly Cys Pro Ala Thr Gly Thr Leu Tyr Gly Trp Ala Asp Val Asp Gln Arg Thr Arg Leu Thr Gly Asp Ala Leu Leu Leu Gly
 Met Ala Pro Gly Cys Gly Ile His Ser Asp His Arg Ala Ala Leu Asp Glu Lys Asp Pro Ile Phe His Ala Met Glu Ser Gly Ala Cys Pro
 Val Asp Pro Val Gln Ala Lys Arg Asp Ile Glu Ala His Ala Gly Gly Val Ala Thr Leu Gly Arg Tyr Ala Ala Ser Leu Thr
 Arg Met Ser Glu Val Leu Asp Tyr Ala His Ser Ala Asp Cys Ala Arg His Gly Gly Gln Cys Asp Tyr Ala Arg Gln Pro Asn Arg Val Glu
 Ile Arg Pro Asp Gly Leu His Ala Ala Leu Lys Gly Pro Met Gly Ser Ala Ser Thr Val Ser Glu Val Phe Leu Leu Glu His Gly Gln Gly
 Leu Pro Gln Glu Val Ala Trp Gly Arg Ile His Asp Ala Gln Asp Trp Thr Leu Leu Met Gln Ala His Asn Ala Gln Phe Asp Leu Met
 Ala Lys Thr Pro Tyr Met Ala Thr Arg Arg Gly Thr Pro Met Leu Ala Ser Val Leu Asp Ala Leu Glu Arg Arg Ala Gly Ala Pro Ala Pro
 Glu Leu Ala Val Lys Gly Pro Lys Leu Pro Gln Gly Asn Arg Val Tyr Val Leu Thr Ala His Asp Thr Asn Leu Ala His Leu Ala Gly Leu
 Leu His Leu Asp Trp Thr Leu Pro Glu Gln Pro Asp Thr Pro Pro Gly Gly Ala Met Val Phe Ser Leu Trp Arg Glu Pro Gly Thr Gln
 Ala Arg Phe Val Arg Val Glu Met Val Tyr Gln Ser Met Asp Gln Leu Thr Pro Leu Ser Leu Ala Gln Pro Pro His Arg Leu
 Ile Leu Pro Leu Pro Gly Cys Ala Asp Ala Ala His Gly His Ala Cys Ser Leu Pro Glu Phe Ser Arg Val Arg Ala Ala Leu Ser Pro
 Ser Cys Leu Glu Ala Val Thr Ala Ala His;

FIGURE 5K: NUCLEOTIDE SEQUENCE FOR THE EXPRESSED Y. PESTIS PHYTASE

ATGTCCGACTGGAGAACCGGTCCGCTTCCGGTTTGTAGTTAATGCTGTCCGGCTGGCTATCACCGGCCTGT
 GGCCCGCAACCATCGGGTACACCTTAGAACGTGTAGTTATTTGAGTCGCCATGGTGGCTAGCCGACTAAGCAG
 ACGCAGTGAATGATGTAACACCTGATAAGTGGCTCAGTGGCCGGTTAAAGCGGGCTATTTGACTCCTCGTGGCG
 CCGAACTGGTCAACCTGATGGCGGTTCTATGGCGATTATTTCCGCACTTGGCTTTTGGCCGGGCTGCCCGGC
 AGAGGGCGGTGATATGCACAGGCAGATATCACAGCGCACTCGTTAACCGGTCAAGCTTTCTGGATGGTGGCG
 CCGGTTGGCGCTGACTGTCCACAATCAGGCCGATCTTAAGAAACCGATCCTCTTTTATCCCGTTGAAACCGCG
 TCTGTAACTGGACAACGCCAAACCGATAAGGCAATTGAGAACCGCTGGCGGCCGTTAGACCGTAAGCCAGC
 GCTATGCCAAACCGTTTGGCAAAATGGCGATGTCTGAACCTCGCTGCGAGTCCGTACTGCAAGTCACTGACAGCA
 GGGGAAAACCTTGTGACTTCGACACTTTGGGCCAACGAAGTTAATGTAACAAGGAGGCACGAAAGTTACCCCTGTC
 AGCCCCCTGGCGTGTAGCACGTTGGCGAAATCTTCTGTCAGAAACGCGCAGGCGATGCCCGAAGTAGCGTG
 GCAGCTTTGAAAGCGCTGAGAACTGGGTGTCTTCTGAGCTGCACAAATGCACAGTTCAACCTGATGGCTAAACG
 CCATACATTGCACGCCACAAGGACGCCGCTTTACAGCAATCGATACCGCACTGACCTGCAACTGGACGCCCG
 GGGCAAAACCTGCCGATCTGGCTCAGAACCGTGTATTCTCTGGTGGCCACGACACAAATATTGCTAACATCGCG
 GTATGCTGGCGCAGATTGGCAGTTACCGGAACAACCGGATAACACCCACCGCGCGGCTGTGGTCTTTGAGCTGT
 GGCAGATCCGGACAATCATCAACGTTATGTGGCGTTAAGATGTTCTATCAGACCATGGATCAATTGCGTAACGCCGA
 GAAGCTGGATTAAAGAAACAATCCCGCGCATCATAGTGTGCTGGCGGCTGCGAGAATAATGTGACGATAA
 ACTGTGCCAACTTGATACTTTTCAAAAAAAGTAGCGAAAGTCACTGGCTGCATATTAA

FIGURE 5L: AMINO ACID SEQUENCE FOR THE EXPRESSED Y. PESTIS PHYTASE
 MSGLENRVRLSGLVLMISGLAATAPVAAEPSGYTLERVILSRHGVRSPTKQTQLMNDV
 TPDKWPQWPVKAGYLTPRGAELVTLMGGFYGDYFRSLGLLAAGCPAEGGVYAQADIDQRT
 RLTGQAFLDGVAPGCCGLTVHNQADLKKTDPLFHPVETGVCKLDNAQTDKAIEERLGGPLD
 TVSQRYAKPFAQMGLVNFASPYCKSLQQQKTCDFAHFAANEVNVNKEGTVTLISPL
 ALSSTLGEIFLLQNAQAMPEVAWQRLKGAENWVSLSLHNAQFNLMAKTPYIARHKGTPL
 LQQIDTALTLQLDAQGGKLPISAQNRVFLFGGHDNTNANAGMLGADWQLPEQPDNTPPG
 GGLVFELWQNPDNHQRVAVKMFYQTMQDLRQNAEKLKNNPAGIISVAVAGCENNGDDK
 LCELDTFQKKVAKVIEPACHI

953-6	(1)	-----MIDKFIQGRESVKHSLLSALLGCAASAPGDAAPAAAGS----	
rhizobium	(1)	-----VKHSLLPALLGCAASAPGDAAPAAAGS----	
954-2	(1)	MKKTIVRRVQRRGACATLLACSTQLPAPATILSAAGSEPRKAA	
appa	(1)	-----MKALIPFLSLLIPITPQSAFQSEEE-----	
Yersinia2frey	(1)	-----MSVLENRVRLSLVLMLSGAAITAAPVAATSG----	
Consensus	(1)	V S LLLAALLA LAALAP AAAA AEP	
	51	Region1	Region 2 100
953-6	(44)	-----LKKEVVMHMPGKAVPPGYSATTDFTQDFGL	
rhizobium	(32)	-----LKKEVVMHMPGKAVPPGYSATTDFTQDFGL	
954-2	(51)	ATDGMPODWSLALVYSSTPEPPLESISPDPITQPTAH	
appa	(28)	-----LKESVIMSPHAKATQINQDTPDAITTKLGW	
Yersinia2frey	(34)	-----YTFEVILSRHVTGKOTQLNDTPDKIQPKAGY	
Consensus	(51)	LKLEKVVILSRHGVRSPTKA LM VSPD WP WPV G L	
	101		150
953-6	(86)	TPHCAAGVKLLIESDRLTFGRILFPDG-CAATTVLKTSYKEKIA	
rhizobium	(74)	TPHCAAGVKLLIESDRLTFGRILFPDG-CAATTVLKTSYKEKIA	
954-2	(101)	EDRGAALVSQMRYYGDWLRARPLPASGPAATYHGWADQPTLGG	
appa	(70)	TPRGCELAYLQHQRLVADLLAKKGPOSQVATLADVDERTKGG	
Yersinia2frey	(76)	TPRGAEVTLNGGYGDFRSLLLAAG-CAEAGVYAOQDIDQERLGG	
Consensus	(101)	TPRGAALV LLG Y R YF ARGLLP G CPAAGTI L ADVDERTR TG	
	151		200
953-6	(135)	QNWAAAFMGCTADVHPAP-DEAITHGLDGPASFQKRAFDAALAO	
rhizobium	(123)	QNWAAAFMGCTADVHPAP-DEAITHGLDGPASFQKRAFDAALAO	
954-2	(151)	DALLHMAAGLTHSDHRLALDKPIHHEACPVFVQAKRDIEAH	
appa	(120)	EAFAGLAPDAITVHTQDTSSPPIPLNPLKTVCOLNANVTDAILSR	
Yersinia2frey	(125)	QALDVAAGGLTVHNOADLKKTPLEHPELVCKLNAQTDKAIER	
Consensus	(151)	QAFAGLAPGCAI V H AG D DPFHGLDTG C LD QA DAILA	
	201		250
953-6	(184)	APRGLTAETARHCELTLLALNCALPACPLIAEP-----SR--LV	
rhizobium	(172)	APRGLTAETARHCELTLLALNCALPACPLIAEP-----SR--LV	
954-2	(201)	AGESCVATLGRRAALSTRSEVLDYHSAADCAHGG---QCDYAR-QPN	
appa	(170)	AG-ESTADFTCHROTAFRELEFINTPQSNLCLKREKQDESCSLTQALPS	
Yersinia2frey	(175)	LG-PLDVTQRYAKPFAQNGDINTAASPYCKSLQQQKTCDFHFAAN	
Consensus	(201)	AGEGGL TARH G LT LAKVLNFA SA CL E C AR	
	251		300
953-6	(225)	AQPHD-----TPDLEPLDVG TASQTLVLELEGKMAEVGCGVY-RAD	
rhizobium	(213)	AQPHD-----TPDLEPLDVG TASQTLVLELEGKMAEVGCGVY-RAD	
954-2	(247)	RVEIRPDELHAALKPINGSATYSEFLEHCGQLPQEQVAGTHDQD	
appa	(219)	ELKYS--ADNVLSTAVSLAMLEFLQCGQ--MPEPGGLDHHQ	
Yersinia2frey	(224)	EENYNKESTVTLSPLAISTTGEFLQAOA--MPEVQLKGAEN	
Consensus	(251)	V V G R L GPL LASTLSEIFLLEYAQG PM EVGWGRIS A E	
	301		350
953-6	(270)	IEQRLRFPLKRYSNRPGYIAAAAAIVREIVATDSNEPA-----	
rhizobium	(258)	IEQRLRFPLKRYSNRPGYIATAAAIVREIVATGDSREP-----	
954-2	(297)	WTLHQAENACDILMAKTPYITRTITNLASTDERRAGAPELA	
appa	(265)	WNTLSLENACYLLORTPEVRSRATPILDLIKTPHPQEQ-QAYG	
Yersinia2frey	(272)	WVSLSLNACNIMAKTPYIRHATPILQOQIDTTLQLDAGGQKLP	
Consensus	(301)	W LL HNAQF LMNRTPIA RATPIL IVTAL SPAR V	
	351	Region 3	400
953-6	(314)	-----TTLAGHWDLGFFDLHQAISYSADEVTSALG	
rhizobium	(302)	-----TTLAGHWDLGFFDLHQAISYSADEVTSALG	
954-2	(347)	KGPKLPQGNRVYVLTATNLHLGLMLDITLLEQF-INTTGGALV	
appa	(314)	TLP-----TSVLETAGHNLNLGALALNLTILGQF-INTTGGELV	
Yersinia2frey	(322)	SAQ-----NRVLFICGHNANLACMLGADQLLEQF-INTTGGELV	
Consensus	(351)	V LLAGHDTNLA LGG LDL WQLP QP DETPPGGALVF	
	401		450
953-6	(354)	ELVSNAG-DRYVRAFYRACTMDLLENLEPGSG-DALYRRYLEPCH	
rhizobium	(342)	ELVSNAG-DRYVRAFYRGCTMDLLENLEPRSD-DTLFRRYLEPCH	
954-2	(396)	SLWREPGTQARVVRVYVMDLPLQLTPLSLA-QPPHREILPCHAD	
appa	(358)	ERWRRLSDNSQNVSVVCTQDQKTPSLN-TPPGEVKLTAAGEE	
Yersinia2frey	(366)	ELWQNPDNHQRYVAVKFTMDLNAEKDLKNPAGITSVAALZEN	
Consensus	(401)	ELW N RYVRV M YQTMQDLRNLEPL L P RI LPIPGCG	
	451		482
953-6	(402)	SEVETASWSDPAPRG-----	SEQ ID NO: 6
rhizobium	(390)	SEVETACAWSDPAPRG-----	SEQ ID NO: 8
954-2	(445)	TAHGHASLFFERRVRAALSPCLEAVTAAH	SEQ ID NO: 10
appa	(407)	RNAQGM SLACFQVNEARIPACSL-----	SEQ ID NO: 16
Yersinia2frey	(416)	NGHDKLELTQKQKVAKVIETCHI-----	SEQ ID NO: 4
Consensus	(451)	S EA ACSLSDFARLVA PAC	SEQ ID NO: 14

FIGURE 6

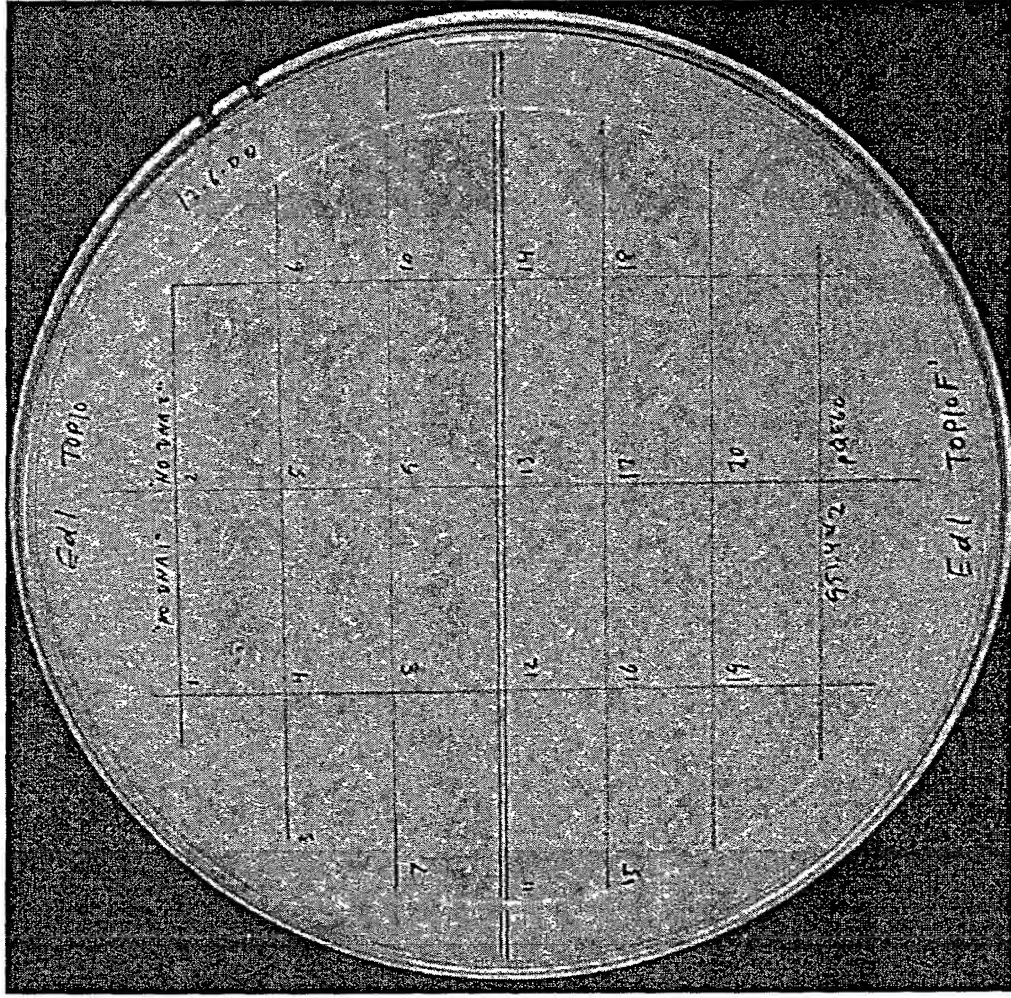


Figure 7A: Results of overlaying isolates from the re-transformation of SEQ ID NO:11 phytase plasmid DNA.

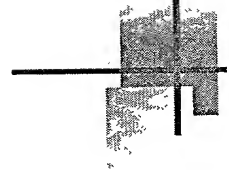


Figure 8

- $T_{1/2}$ of Phytase in Pepsin Digestion

Host	$T_{1/2}$ (min)
E. Coli	~ 8
Pichia	~ 10
S. Cerevisiae	~ 25

Figure 9

QSEPELKLES VVIVSRHGVR APTKATQLMQ DV**T**PDAWP**T**W PVKLGELTPR GGELIAYLGH
 YWRQRLVADG LLPKCGCPQS GQVAIIADVD ERTRKTGEAF AAGLAPDCAI TVH**T**QAD**T**S
 PDPLFNPLKT GVCQLDNA**N**V TDAILERAGG SIADFTGHYQ TAFRELERVL NFPQSNLCLK
 REKQDESCSL TQALPSELKV SADCVSLTGA VSLASMLTEI FLLQQAQGMPEPGWGRITDS
 HQWNTLLSLH NAQFDLLQRT PEVARSRATP LLDLIK**T**ALT PHPPQKQAYG VTLPTSVLFI
 AGHDTNLANL GGALEL**N**WTL PGQPDNTPPG GELVFERWRR LSDNSQWIOV SLVFQTLQQM
 RDKTPLSLNT PPGEVKLTLA GCEERNAQGM CSLAGFTQIV NEARIPACSL

Figure 10

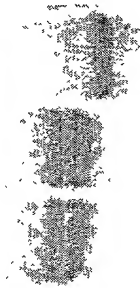
Pichia

1 2 3



S. Cerevisiae

4 5 6



- Without treatment
- O-glycosidase
- Endo H

- 4. Without treatment
- 5. O-glycosidase
- 6. Endo H

Figure 11

	Pichia	S. Cerevisiae
O-glycosilation	no	no
N-glycosilation	yes	yes
N-glycosilated form	1 dominates	2

Figure 12A

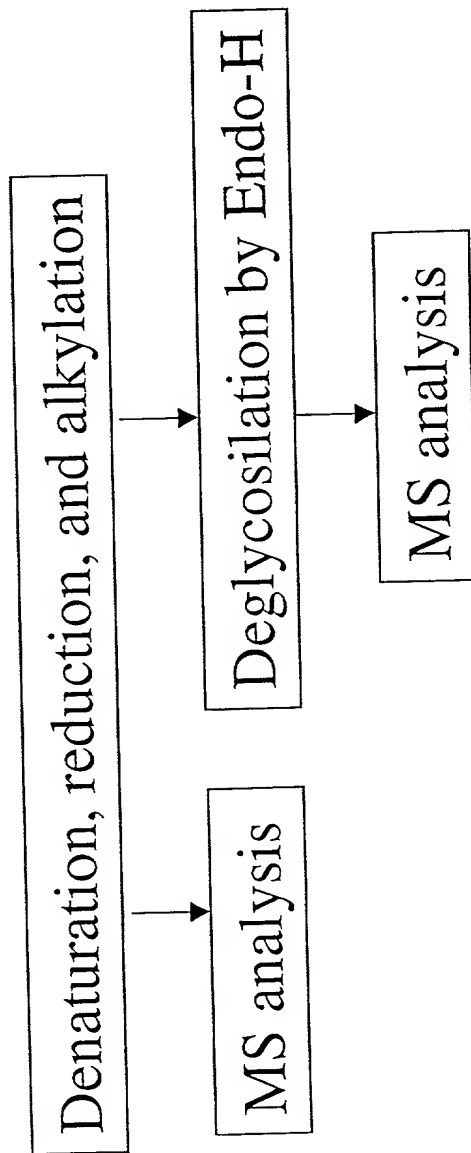


Figure 12B

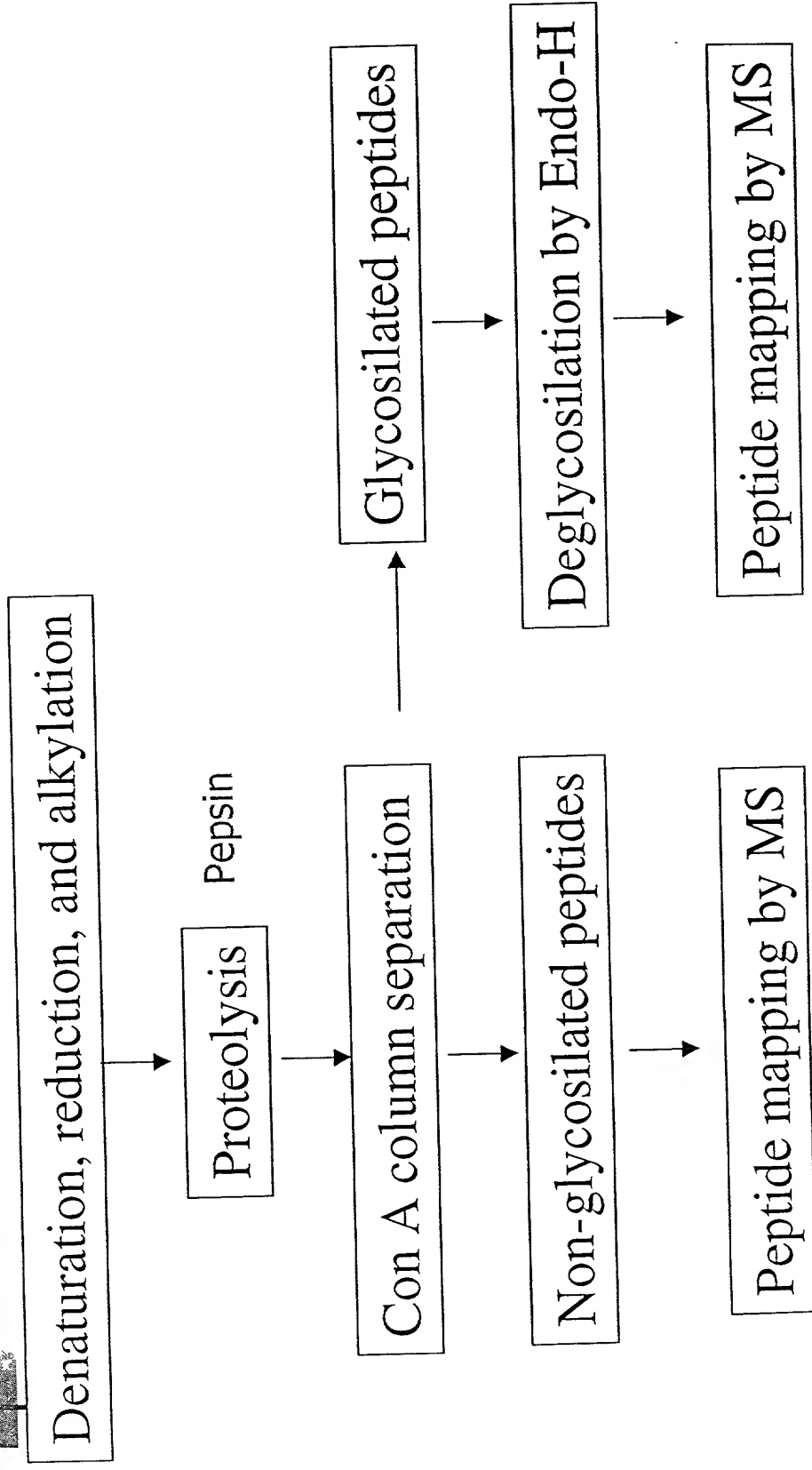


Figure 13A

QSEPELKLES VVIVSRHGVR APTKATQLMQ DVTPDAWPTW PVKLGELTPR GGELIAYLGH
 YWRQRLVADG LLPKCGCPQS GQVAIIADVD ERTRKTGEAF AAGLAPDCAI TVHTQADTSS
 PDPLFNPLKT GVCQLDNANV TDAILERAGG SIADFTGHIYQ TAFRELERVL NFPQSNLCLK
 REKQDESCSL TQALPSELKV SADCVSLTGA VSLASMLTEI FLLQQAQGMPEPGWGRITDS
 HQWNTLLSLH NAQFDLLQRT PEVARSRATP LLDLIKALT PHPPQKQAYG VTLPTSVLFI
 AGHDTNLANL GGALELNWTL PGQPDNTPPG GELVFERWRR LSDNSQWIV SLVFQTLQQM
 RDKTPLSLNT PPGEVKLTLA GCEERNAQGM CSLAGFTQIV NEARIPACSL

Figure 13B

QSEPELKLES VVIVSRHGVR APTKATQLMQ DVTPDAWPTW PVKLGELTPR GGELIAYLGH
YWRQRLVADG LLPKCGCPQS GQVAIIADVD ERTRKTGEAF AAGLAPDCAI TVHTQADTSS
PDPLFNPLKT GVCQLDNANV TDAILERAGG SIADFTGHYQ TAFRELERVL NFPQSNLCLK
REKQDESCSL TQALPSELKV SADCVSLTGA VSLASMLTEI FLLQQAQGMPEPGWGRITDS
HQWNTLLSLH NAQFDLLQRT PEVARSRATP LLDLIKALT PHPPQKQAYG VTLPTSVLFI
AGHDTNLANL GGALEL**N**WTL PGQPDNTPPG GELVFERWRR LSD**N**SQWIQV SLVFQTLQQM
RDKTPLSL**N**T PPGEVKLTLA GCEERNAQGM CSLAGFTQIV NEARIPACSL



Figure 14

- Phytase in *Pichia*

- There are three forms of phytase in *Pichia*. Each of them contains a single glyco-chain linked on amino acid #317, or #344, or #369.

- Phytase in *S. Cerevisiae*

- There are three forms of phytase in *S. Cerevisiae*. The first form has two glyco-chain linked on amino acid #317 and #344. The second and third form carries a single glyco-chain that is linked on amino acid #317 or #344.